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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/625,166	07/22/2003	Janos Fucsko	MI22-2246	8008

21567 7590 12/21/2005
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EXAMINER

SMOOT, STEPHEN W

ART UNIT	PAPER NUMBER
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2813

DATE MAILED: 12/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/625,166

Applicant(s)

FUCSKO ET AL.

Examiner

Stephen W. Smoot

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 August 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-62 is/are pending in the application.
- 4a) Of the above claim(s) See Continuation Sheet is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8, 13, 15, 20, 26, 30-32, 34-40, 43, 45, 47, 52, 58 and 62 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. <u>11162005</u> . |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____. | 6) <input type="checkbox"/> Other: _____. |

Continuation of Disposition of Claims: Claims withdrawn from consideration are 9-12,14,16-19,21-25,27-29,33,41,42,44,46,48-51,53-57 and 59-61.

DETAILED ACTION

This Office action is in response to applicant's amendment received on 18 August 2005, which includes a declaration under 37 CFR 1.132.

Response to Amendment

1. The declaration under 37 CFR 1.132 received on 18 August 2005 is sufficient to overcome the rejection of claims 1-6, 8, 13, 15, 20, 26, 30-32, 34-38, 40, 43, 45, 47, 52, 58, 62 under 35 USC 103(a), which is based partially upon the prior art of Kaji et al. It is noted that the applicant calculated that the pH of the etching solution taught by Kaji et al. is actually less than the applicant's as-claimed limitation of "at least 10", and experimentally verified that this etching solution taught by Kaji et al. was reasonably close to the calculated value of 8.43. Accordingly, the rejection under 35 USC 103, which is based on using the wrong pH determination of 13.6, is hereby withdrawn.

Election/Restrictions

2. Claims 9-12, 14, 16-19, 21-25, 27-29, 33, 41-42, 44, 46, 48-51, 53-57, 59-61 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to nonelected species, there being no allowable generic or linking claim. Claims 7, 39 are

rejoined because applicant has amended them to read on the elected ammonium hydroxide species. Applicant timely traversed the restriction (election) requirement in the reply received on 22 November 2004.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-8, 13, 15, 20, 26, 30-32, 34-40, 43, 45, 47, 52, 58, 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujiwara et al. (US 5,155,058) in view of Chance (US 3,434,896) and Kaji et al. (US 5,650,043).

Referring to Figs. 6-7 and column 5, line 60 to column 6, line 50, Fujiwara et al. disclose a method of removing silicon from a substrate that includes depositing a layer comprising undoped silicon in elemental form (107) over a substrate (104) that includes an oxide layer (105) and a nitride layer (106). Fujiwara et al. further disclose the selective removal of some silicon from the silicon layer (107), relative to the oxide layer (105) and the nitride layer (106), to form a flattened silicon layer (108) as shown in Figs. 6D and 7B. These are limitations as set forth in claims 1, 20, 26, 31, 32, 52, 58 of the applicant's invention.

However, Fujiwara et al. lack the limitations of independent claims 1, 31 of exposing the silicon layer to a liquid etching solution that includes hydroxide and fluorine and has a pH of at least 10. Also, Fujiwara et al. lack the further limitations to claim 1 as set forth in claims 2-8, 13, 15, 30 and the further limitations to claim 31 as set forth in claims 34-40, 43, 45, 47, 62.

Chance teaches a liquid etching solution for etching silicon monoxide that includes ammonium fluoride and an alkaline agent for adjusting the pH to be within the range of 7.5 to 14. The most preferred alkaline agent is ammonium hydroxide. Kaji et al. teach that similar wet etching chemistries are also suitable for etching silicon (see column 5, line 9 to column 6, line 3), which would suggest that their would be a reasonable expectation for success in applying the liquid etching solution of Chance for etching elemental silicon layers.

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Fujiwara et al., Chance, and Kaji et al. in order to use the liquid etching solution of Chance for etching the silicon layer of Fujiwara et al. Kaji et al. recognize that wet etching processes are advantageous over dry etching processes like the RIE process of Fujiwara et al. because they do not involve energy beam irradiation, which results in the formation of defects (see column 1, lines 12-24), and they retain atomic order flatness (see column 5, line 9 to column 6, line 3).

Regarding the limitations of claims 5-7, 37-39, these claimed ranges are *prima facie* obvious unless the applicant can show unexpected results relative to the liquid

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etching solutions of Chance, since it has been held that claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art [see *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990) and *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996)].

Regarding claims 30, 62, Kaji et al. recognize that the presence of fluoride is effective at retaining atomic order flatness (see column 5, line 9 to column 6, line 3).

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Li teaches the selective etching of polysilicon with an aqueous solution that includes ammonium fluoride and ammonium hydroxide. O. Tabata teaches the use of ammonium hydroxide for etching silicon.


6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen W. Smoot whose telephone number is 571-272-1698. The examiner can normally be reached on M-F (8:00 am to 4:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SWS


STEPHEN W. SMOOT
PRIMARY EXAMINER